

## **A Self-Assembled Two Dimensional Electron Gas: $\sqrt{7}\times\sqrt{3}$ In on Si(111)**

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We present measurements of the Fermi surface and underlying bandstructure of a single layer of Indium on Si(111) with  $\sqrt{7}\times\sqrt{3}$  periodicity. Electrons from both indium valence electrons and silicon dangling bonds contribute to a nearly free, two-dimensional electron gas (2DEG) on a pseudosquare lattice, which is almost completely decoupled at the Fermi level from the underlying hexagonal silicon lattice. About half of the Si dangling bond electrons is donated directly to the 2DEG, while the remainder form three bands which we associate with In/Si covalent bond formation. The mean free path inferred from our data is evidently limited only by the scattering at step edges, suggesting the system might be a suitable model for studying the ground state of two-dimensional metals.